Appendix D2

Print Form

FORM DG03
Request for a Connection Impact Assessment Review / Update To Connect Embedded Generation to Kitchener-Wilmot Hydro Inc.'s Electrical Distribution System

Please highlight in yellow any information below that has changed since previously providing the information.

Section 1: General Connection Information

Note: ALL of the information in *"Section 1: General Connection Information"* must be completed in full. Failure to provide complete information may delay the processing of the data.

All technical documents must be signed and sealed by a licensed Ontario Professional Engineer.

Date: _____

1. **Project Name:** _____
2. **Project Dates:** Proposed Start of Construction: _____
   Proposed In-Service: _____
3. **Project Size:** Number of Units _____
   Nameplate Rating of Each Unit _____ kW
   Number of Phases (1 or 3) _____
   Proposed Total Capacity _____ kW
4. **Project Location:** Address: _____
5. **Kitchener-Wilmot Hydro Account Number (if applicable):** _____
6. **Project Information:**

   Project Developer:

   Company / Person: _____
   Contact Person: _____
   Mailing Address: _____
   Telephone Number: _____
   Fax Number: _____
   E-Mail: _____

Project Owner (if not same as Project Developer:

Company / Person: _____
Contact Person: _____
Mailing Address: _____
Telephone Number: _____
Fax Number: _____
E-Mail: _____

Engineering Consultant (Electrical):

Company / Person: _____
Contact Person: _____
Mailing Address: _____
Telephone Number: _____
Fax Number: _____
E-Mail: _____

7. Project Type:

☐ Wind Turbine ☐ Hydraulic Turbine ☐ Steam Turbine ☐ Solar
☐ Diesel Engine ☐ Gas Turbine ☐ Fuel Cell ☐ Biomass
☐ Co-generation/CHP (Combined Heat & Power)
☐ Other (Please Specify): _____

8. Mode of Operation:

☐ 24 Hour or Base Load ☐ Peak Period Only ☐ Load Displacement ☐ Emergency Backup

Will Emergency Backup generator be synchronized to Kitchener-Wilmot Hydro Inc.'s system at any time?

☐ Yes ☐ No ☐ Other (Please Specify): _____

9. Intent of Generation:

☐ IESO FIT Program, Contract # _____ ☐ Net Metering
☐ Load Displacement ☐ Other (Please Specify): _____

10. Location and Site Plan

Provide Site Plan with approximate line routings for connection to nearby Kitchener-Wilmot Hydro Inc. facilities. The Site Plan should include roads, concession and lot numbers and nearby power lines.

Drawing / Sketch No. _____ Rev. _____

11. Proposed connection voltage to Kitchener-Wilmot Hydro Inc.'s distribution system (if known): _____ kV

Section 2: Connection Impact Assessment Information

Note:

(a) It is important that the Generator provide ALL the information requested below, if applicable. All information is required to complete the impact assessment process. Indicate "Not Applicable" where appropriate.

(b) In certain circumstances, Kitchener-Wilmot Hydro Inc. may require additional information to conduct the Connection Impact Assessment. Should this be the case, the Generator will be duly advised.

Provide detailed and updated SLD of the EG facility including the interface point to the Kitchener-Wilmot Hydro Inc.'s distribution system. This drawing shall include as a minimum:

- Electrical equipment at EG's facilities, their principal ratings, impedances, winding configurations, neutral grounding methods, etc.
- Protective relaying, synchronizing and revenue metering arrangements. The device numbers should be in accordance with those adopted in the ANSI / IEEE Standard C37.2 - 1979: IEEE Standard Electrical Power System Device Function Numbers.

The SLD shall include the following, as applicable:

- Disconnecting device at the interface (connection) point with the Kitchener-Wilmot Hydro Inc.'s distribution system
- Load break switches
- Fuses
- Circuit breakers
- Interface step-up transformer
- Intermediate transformer(s)
- CT's and VT's (quantity, location, connection, ratio)
- Generators (rotating / static)
- Power factor correction capacitors and their switching arrangements (particularly for induction units)
- Motors
- Power cables
- Surge arresters
- Any other relevant electrical equipment.

- SLD Drawing Number: _____ Rev. _____

☐ Attached

☐ Mailed Separately

1. Generator Facility Fault Contributions for Faults at the Interface Point/PCC

All values to be at the nominal connection voltage to Kitchener-Wilmot Hydro Inc.'s distribution system, i.e. the high voltage side of the Facility Interface (step-up) transformer.

Maximum Symmetrical (all generators online)

- Three-phase fault _____ kA
- Phase-to-phase fault _____ kA
- Single-Phase to ground fault _____ kA

2. Generator Characteristics:

a. Number of generating unit(s): _____

b. Manufacturer / Type or Model No. _____ / _____

c. Rated capacity of each unit

Gross	_____ kW	_____ kVA
Net	_____ kW	_____ kVA

If unit outputs are different, please fill in additional sheets to provide the information.

d. Type of generating unit:

☐ Synchronous ☐ Induction ☐ Static Power Converters (SPC) / Inverters

☐ Other (Please Specify) _____

e. Rated frequency _____ Hz

f. Number of phases ☐ One ☐ Three

g. **For Synchronous Units:**

i) Generation voltage _____ kV

ii) Rated current _____ A

iii) Rated power factor of generating unit(s) _____ p.u.

iv) Type and characteristics of exciter

_____

_____

v) Minimum power limit for stable operation

vi) Unsaturated reactances on:

Direct axis synchronous reactance, Xd			kW
Direct axis transient reactance, Xd'	_____	kVA base	_____ kV base
Direct axis subtransient reactance, Xd"			p.u.
Negative sequence reactance, X2			p.u.
Zero sequence reactance, X0			p.u.

vii) Limits of range of reactive power

Lagging (over-excited)		kVAR
Leading (under-excited)		kVAR

viii) Provide a plot of generator capability curve (MW output vs. MVAR)
Document Number: _____ Rev. _____

h. **For Induction Units:**

i) Generation voltage		kV
ii) Rated design power factor		p.u.
iii) Rated speed		RPM
iv) Slip regulation interval		%
v) Rated Slip		%
vi) Actual power factor at delivery point (after p.f. correction):		
- Full output		p.u.
- No output		p.u.
vii) Generator reactive power requirements:		
- Full output		kVAR
- No output		kVAR

viii) Total power factor correction installed _____ kVAR

- Number of regulating steps _____

- Power factor correction switched per step _____ kVAR

- Power factor correction capacitors are automatically switched off when generator breaker opens ☐ Yes ☐ No

ix) Starting inrush current limited to (multiple of full load current) _____ p.u.

x) Locked rotor current (at rated voltage) _____ p.u.

xi) Fault current vs. time curves (for various types of faults near the generator) _____ Dwg. No.

i. For SPC / Inverter type units:

i) Terminal voltage _____ V

ii) Line - interactive type (i.e. intended for parallel operation with electric utility) ☐ Yes ☐ No

iii) Power factor _____

iv) Battery backup provided ☐ Yes ☐ No

v) Maximum fault current for terminal faults _____ A

vi) Standards according to which built _____

vii) Provide Manufacturer's technical brochure and specification sheet _____ Doc. No.

j. Kitchener-Wilmot Hydro Inc. uses distribution modeling software for Impact Assessments. Describe how your equipment should be modeled for load flow, voltage study and short circuit analysis.

3. Interface Step-up Transformer Characteristics:

a. Transformer rating _____ kVA

b. Manufacturer _____

c. Nominal voltage of high voltage winding _____ kV

d. Lightning impulse level of high voltage winding, full wave _____ kV

e. Nominal voltage of low voltage winding _____ kV

f. Number of phases _____

g. Construction (core or shell) _____

h. Number of legs _____

i. Impedances on: _____ kVA base _____ kV base

R: _____ p.u. X: _____ p.u.

j. High voltage winding connection ☐ Delta ☐ Star

Grounding method of star connected high voltage winding neutral

☐ Solid ☐ Ungrounded ☐ Impedance: R _____ X _____ ohms

k. Low voltage winding connection

Grounding method of star connected low voltage winding neutral

☐ Solid ☐ Ungrounded ☐ Impedance: R _____ X _____ ohms

l. Tapping range, location and type of tap changer _____

m. Expected tap settings HV _____ kV LV _____ kV

Note: The term 'High Voltage' refers to the connection voltage to LDC's distribution system and 'Low Voltage' refers to the generation or any other intermediate voltage.

4. Intermediate Transformer Characteristics (if applicable):

a. Transformer rating _____ kVA

b. Manufacturer _____

c. Nominal voltage of high voltage winding _____ kV

d. Nominal voltage of low voltage winding _____ kV

e. High voltage winding connection ☐ Delta ☐ Star

Grounding method of star connected high voltage winding neutral

☐ Solid ☐ Ungrounded ☐ Impedance: R _____ X _____ ohms

f. Low voltage winding connection ☐ Delta ☐ Star

Grounding method of star connected low voltage winding neutral

☐ Solid ☐ Ungrounded ☐ Impedance: R _____ X _____ ohms

g. Impedances on: _____ kVA base _____ kV base

R: _____ p.u. X: _____ p.u.

h. Tapping range, location and type of tap changer _____

i. Expected tap settings HV _____ kV LV _____ kV

Note: The term 'High Voltage' refers to the connection voltage to LDC's distribution system and 'Low Voltage' refers to the generation or any other intermediate voltage.

Note:

(a) The term "High Voltage", used above, refers to the intermediate voltage that is input to the interface step-up transformer, and "Low Voltage", used above, refers to the generation voltage.

5. Generating Facility Load Information

a. Maximum continuous load:

- Total: _____ kVA _____ kW
- Generator Auxiliary Load Only: _____ kVA _____ kW

b. Maximum start up load: _____ kVA _____ kW

c. Largest motor size that would be started: _____ HP _____ kW

d. Maximum inrush current of the motor (multiple of full-load current): _____ p.u.

e. For load displacement generators:

- Max. present load at Generator's facility: _____ kVA _____ kW
- Max. future load at Generator's facility (excluding Auxiliary Loads): _____ kVA _____ KW
- Indicate the means by which injection of power into Kitchener-Wilmot Hydro Inc.'s system will be prevented:

_____

6. Operation Information:

- Annual Capacity Factor: _____ %
- Prospective number of annual scheduled starts / stops, and timing: _____

7. Expected Monthly Generation, Consumption and Output From the Facility:

Expected	Total Generation (a)		Total Internal Consumption (b)		Total Output (To Kitchener- Wilmot Hydro Inc.'s Distribution System) (a-b)*	
	kWh	Peak kWh	kWh	Peak kW	kWh	Peak kW
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

* This value would be negative when the generators are not in operation or when the internal consumption exceeds generation.

8. Protection Design, Philosophy and Logic:

- Provide a document describing the protection philosophy for detecting and clearing:
  - Internal faults within the EG facility;
  - External phase and ground faults (in LDC's distribution system;
  - Certain abnormal system conditions such as over / under voltage, over / under frequency, open phase(s);
  - Islanding

Document Number: _____ Rev. _____

Include a tripping matrix or similar information in the document

Note: EG shall install utility grade relays for the interface protection. The protection design shall incorporate facilities for testing and calibrating the relays by secondary injection.

Please do not feel inhibited by the space provided here. Use as much space and as many additional sheets as are required to describe how the Generator protection will deal with faults, outages, disturbances or other events on the distribution system and for the generator itself.

Protective Device	Range of Available Settings	Trip Time	Trip Set Point	Describe operation for disconnecting the generator or inverter in the event of a distribution system outage	Describe operation for disconnecting the generator or inverter in the event of a distribution system short circuit (three-phase and single-phase to ground)
27 Phase Undervoltage Instantaneous					
27 Phase Undervoltage					
50 Phase Instantaneous Overcurrent					
50G Ground Instantaneous Overcurrent					
51 Phase Time Overcurrent					
51G Ground Time Overcurrent					
50 Phase Overvoltage Instantaneous					
59 Phase Overvoltage					
81 Under Frequency					
81 Over Frequency					
87 Transformer Differential					
Other					

9. Connection and Operation Information:

a. Synchronizing and paralleling scheme / procedure _____ Doc. / Dwg. No.

b. The generator is designed with auto-connection scheme ☐ Yes ☐ No

10. Document List:

Item No.	Description	Reference No.	No. of Pages
1			
2			
3			
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11. Drawing List:

Item No.	Description	Reference No.	No. of Pages
1			
2			
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12. Other Comments, Specifications and Exceptions (attach additional sheets if needed)

13. Applicant and Project Design / Engineering Signature

To the best of my knowledge, all the information provided in this Application Form is complete and correct.

Applicant Signature _____ Date _____

Project Design / Engineering Signature _____ Date _____

Return this form to: Kitchener-Wilmot Hydro Inc., 301 Victoria Street South, Kitchener, ON N2G 4L2. Attn: Shaun Wang, P.Eng., System Planning & Projects Engineer

E-Mail: swang @kwhydro.ca

Phone: (519) 745-4771 ext. 6312

Print Form